

guided optical wave structure, such as is employed in an integrated optical spectrum analyzer.

It is to be understood that the above-described embodiments are merely illustrative of some of the many specific embodiments which represent applications of the principles of the present invention. Clearly, numerous and varied other arrangements may be readily devised by those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. An optical element for adjusting the effective focal length of a planar geodesic lens system, said lens system comprising:

a substrate;

a diffused planar surface layer on said substrate, said surface layer conforming to the contour of said substrate and being transmissive of optical radiation and having a source end, for receiving input optical radiation and a detector end, for transmitting optical radiation traversing said surface layer; at least one spherical depression in said substrate, with said surface layer following said at least one spherical depression in said substrate so as to form at least one geodesic lens in said surface layer, said at least one geodesic lens being shaped so that a substantial portion of the optical radiation passing through said planar surface layer from said source end toward said detector end is focussed by said geodesic lens toward said detector end;

characterized in that said optical element comprises at least one non-geodesic or non spherical auxiliary depression in said substrate positioned between said at least one geodesic lens and said source end or said detector end within the focal path of said geodesic lens, said surface layer following the contour of said at least one auxiliary depression providing an increased path length for optical radiation traversing said surface layer, said auxiliary depression having a depth sufficient to increase the length of the optical path of said surface layer, and thereby the focal length of said at least one geodesic lens, so that the focal line of said at least one geodesic lens is contiguous with the edge of said substrate at said source or said detector end without modification of the external dimensions of said substrate.

2. The optical element of claim 1 wherein said auxiliary depression is cylindrical toroidal ellipsoidal, or ovoidal in geometry.

3. The optical element of claim 1 wherein said auxiliary depression comprises a depression that is an elongated cylindrical shape.

4. The optical element of claim 3 wherein said elongated cylindrical depression is positioned symmetrically about a line extending perpendicular from the focal plane of said at least one geodesic lens through the center of said geodesic lens.

5. An optical element for correcting optical aberrations in lenses in a geodesic lens system having geodesic lens disposed in a planar waveguide optical system, wherein optical radiation in the focal path of said geodesic lenses are defocused due to variations in said lens structure, said element comprising:

at least one surface depression disposed in said planar waveguide optical system in the focal path of at least one geodesic lens in said geodesic lens system said depression being non-geodesic or non-spherical in geometry and configured to focus optical

radiation and correct for optical aberrations in said at least one lens in said geodesic lens system.

6. A method of adjusting the effective focal distance of a geodesic lens system disposed in a planar waveguide on a substrate having a source end and a detector end for optical radiation said planar waveguide being formed by a diffused planar surface layer disposed on said substrate for transmitting in-plane light therethrough, said surface layer conforming to the contour of said substrate, which comprises:

forming at least one auxiliary depression in said substrate to increase the path length for optical radiation transmitted from said source end through said geodesic lens to said detector end, said at least one auxiliary depression being disposed between said geodesic lens and said source end or said detector end, said at least one auxiliary depression being shaped in the form of a non-geodesic or non-spherical groove said auxiliary depression having a depth sufficient to increase the length of the optical path of said surface layer, and thereby the focal length of said geodesic lens, so that the focal line of said geodesic lens is contiguous with the edge of said substrate at said source or said detector end.

7. The method of claim 6 further comprising the steps of:

forming the depression for said geodesic lens in said substrate; testing the focal length of said geodesic lens; forming said auxiliary depression with a depth sufficient to generate an increased optical length in said surface layer so as to alter the focal length of said geodesic lens; and diffusing on said planar surface layer.

8. The method of claim 7 further comprising the steps of:

testing the focal path of said geodesic lens and auxiliary depression combination prior to surface layer deposition; and

adjusting or increasing the depth of said auxiliary depression as required to achieve substantially more accurate focus of said lens and auxiliary depression combination at the edge of said substrate.

9. The method of claim 6 wherein the step of forming said auxiliary depression comprises ultrasonic impact grinding removal of material from said substrate.

10. The method of claim 6 wherein said auxiliary depression is cylindrical toroidal, ellipsoidal, or ovoidal.

11. A method of correcting optical aberrations in geodesic lenses which cause defocussing in a geodesic lens system disposed in a planar optical waveguide on a substrate having a source end and a detector end, said planar waveguide being formed by a diffused surface layer disposed on said substrate for transmitting in-plane optical radiation therethrough, said surface layer conforming to the contour of said substrate, which comprises:

forming at least one auxiliary surface depression in said substrate having non-spherical geometry and disposed in the focal path of said geodesic lens system, said depression having that depth required to increase the optical path length of said surface layer disposed on said auxiliary depression in order to improve the focus of said geodesic lens system so as to compensate for aberrations, said depression positioned adjacent to the site of said aberrations in said lenses.

12. The method of claim 11 wherein said auxiliary depression is cylindrical toroidal, ellipsoidal, or ovoidal.

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